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SOME ILLUSTRATIVE CASES OF THE TREATMENT OF SEPTIC WOUNDS IN A BASE HOSPITAL.

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The problems that have faced the surgeons in the base hospitals in France during the present campaign have been many and varied, and to deal with them successfully departures from the recognized surgical methods have been inevitable. Operative procedures have been adopted which have been the means of saving many a man from fatal septicemia but which could hardly commend themselves to an examiner in the exact art of operative surgery. The extensive septic infection of almost all wounds and the almost universal infection with the Bacillus aerogenes capsulatus have necessitated the freest possible means of cleansing and drainage, and operative methods have had to be adapted to the altered circumstances. Thus it was soon obvious that once emphysematous gangrene was established in a limb and amputation necessary the usual methods of operation with flap-cutting and suturing, even with the freest possible drainage, were useless and almost always resulted in the extension of infection to the stump and death of the patient. The only alternative lay in the recognition of the anaerobic necessities of the infecting organism and a reversion to the primitive direct circular amputation with no attempt to cut a flap, leaving the bone projecting from the stump and the whole freely open to the air; a method with its advantage the saving of the life of the patient, its disadvantage the necessity of a subsequent operation to remove redundant bone and form flaps.

Two cases may be quoted as illustrative:

(1) Patient admitted May 10, 1915, with a bullet wound four inches below the knee-joint penetrating the leg from before backwards, passing between the tibia and fibula. The leg below the wound was cold, markedly swollen, bluish-black in colour and crepitating on pressure, offensive brownish pus with gas bubbles issued from the wound, and patient was in a condition of marked toxemia. The limb was amputated immediately above the knee-joint by the direct circular method. The patient passed an uneventful convalescence and showed no signs of infection of the tissues of the stump. The appearance of the stump is shown in the first photograph when granulation was satisfactorily established a fortnight after operation.

(2) An almost identical case to the above, but the infection had not extended to so high a level and amputation was performed at the
knee-joint. The photograph (2) shows the resulting stump with the condyles of the femur projecting from the retracted tissues. The day on which the photograph was taken was three weeks after the original amputation, and on that day re-amputation was undertaken through the skin one inch above the granulating edge. Formal flaps were cut and sewn up with drainage, the operation resulting in a perfect stump uniting by first intention.

Case 1.—Amputation of leg above knee-joint for gangrene.

Case 2.—Amputation of leg through knee-joint for gangrene.

No less serious a consideration is the possibility of saving the limb when threatening gangrene is present. Many cases come under observation when well-marked infection with the \textit{B. aërogenes} exists and the question to be decided is whether the life of the patient will be endangered by the effort to save the limb. Undoubtedly the responsibility is great, as if the effort fails in its object subsequent amputation may be too late to save the patient from the early and rapid septicæmia which develops in these cases. The third photograph well illustrates such a question.

The patient was admitted with a bullet wound traversing the leg from side to side three inches above the ankle-joint. The entrance and exit wounds were small and blocked with caked blood. A little offensive brownish pus with gas bubbles escaped from the outer wound on pressure.
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The foot was much swollen; over the greater part it was bluish-black in colour, on the dorsum greenish in hue, with the dark veins showing prominently through the skin; marked emphysematous crackling was present on the dorsum of the foot. Round both entrance and exit wounds the skin was absolutely black for a small area, and subcuticular blebs full of blood were present below the inner wound. It was obvious that gangrene of the entire foot was threatening, but inasmuch as the patient's general condition was good an effort was made to save the limb.

Both entry and exit wounds were freely opened up. The fibula was found to be fractured and the back of the tibia grooved; the posterior tibial artery was found divided and ligatured after turning out a large mass of blood-clot.

A large drainage-tube was inserted with some "tabloids" of salt, and the wound packed with gauze soaked in peroxide of hydrogen. The foot was then freely incised, all subcutaneous tissue being gelatinous, brownish-black, and containing free gas.

Hydrogen peroxide dressings were employed, and for as long as possible the foot was kept in the open air under only a single layer of gauze.

Within two days the swelling had entirely disappeared and the foot resumed its normal colour, comparatively little sloughing of subcutaneous tissue occurring.
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It has been argued that in these cases better results are obtained by incisions transverse to the long axis of the limb, obtaining thereby a greater lymph exudate. This is certainly a point to be considered, but against it must be weighed the fact that the subsequent scarring of a number of transverse incisions cannot but interfere to a considerable extent with the lymphatic and venous return from the limb.

The dressings of greatest value in these cases is also a point for consideration. Much is to be said in favour of Wright's hypertonic saline, but from a considerable practical experience of its use I am still inclined to prefer the free use of peroxide of hydrogen, employed both on dressings and by hypodermic injection combined with prolonged exposure of the wounds to sun and air.

![Image of a person dressing a wound]

**Case 5.**—Bullet wound of knee-joint: acute suppurative arthritis: arthroscopy.

Much has been written on the treatment of septic wounds of the knee-joint, and very great judgment must be exercised, especially when the case is complicated by the presence of a retained fragment of metal.

When infection is early and mild and the fragment easily accessible it may be reached by an anterior incision by the side of the patella, and the sepsis effectively dealt with by washing out the joint with saline and subsequent drainage to a similar parallel incision by a drainage-tube behind the patella. Drainage by tubes should be continued for as short
a period as possible, and the wounds allowed to close immediately the effusion subsides. Photograph (4) illustrates such a case.

The patient was admitted with a shrapnel ball lying between the condyles of the femur. There was considerable effusion, but pain was not acute; temperature 102° F., pulse 100. The photograph shows the treatment as suggested above. The shrapnel ball was readily removed through the inner incision. The joint contained blood with some pus but few bacteria; no streptococci were detected.

Drainage was maintained for forty-eight hours by a tube passed behind the patella and the joint irrigated with saline. The photograph was taken three weeks after operation, the joint was then entirely shut off, free movement was possible, and the wounds were granulating. On the other hand, if severe infection is present, especially when the metal fragment is difficult of access, or when it is embedded in one of the condyles, no alternative exists to a complete arthrotomy if the limb is to be saved. Drainage in any other way will be insufficient to deal with infection. An example of such a case is shown in photograph (5).

The patient was admitted having had his left leg amputated above the knee-joint for extensive injury. It was six days since he had been wounded and the right knee-joint was found to contain two fragments of metal, one embedded in the internal condyle. The patient’s condition was bad, the joint was distended, acutely tender, and discharging large quantities of pus through one of the wounds; temperature 102° F., pulse 120. Complete arthrotomy was performed by a semilunar incision below the patella dividing the ligamentum patellae. The crucial ligaments were divided and the cartilages removed. One fragment of shrapnel was found free in the joint and the other removed by a gouge from the substance of the condyle. The interior of the joint was in a condition of acute inflammation and contained pure pus. The leg was put up fully flexed and gradually extended.

The photograph was taken two weeks after the operation with granulation well established. The patient’s condition improved immediately after the operation and his temperature fell to normal within four days. Five weeks after the operation the entire surface was covered with healthy granulation tissue and no discharge beyond slight serous exudate. Under the circumstances it was decided to make an attempt at arthrodesis.

The patella was accordingly excised. The granulations which had entirely replaced the cartilage on the articular surface of the tibia were carefully scraped away. A very thin shaving was removed from the femoral condyles and all granulations well scraped off. The limb was brought into a position of full extension and the flap from which the patella had been removed sewn over. Two drainage-tubes were placed behind the bones, one in front and one passing upwards beneath the skin flap. The flap united by first intention, the two anterior tubes were
removed within ten days; within three weeks of operation there remained only the two posterior tubes, from which there was nothing but slight serous discharge. The temperature is steady and there appears no reason why the somewhat, at first appearance, unlikely possibility of primary union should not take place.

Although the method appears ideal from the point of view of ease of dealing with the sepsis if there is extensive bone injury associated with the suppurative arthritis, the infection may be such that amputation is the only alternative, moreover, it has the great disadvantage that a subsequent operation is necessary to ensure a rigid bony union between femur and tibia.

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A CANVAS SLING FOR LOADING WOUNDED FROM BARGES AND BOATS INTO HOSPITAL TRANSPORTS.

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The loading of wounded from boats and barges into hospital ships and carriers forms one of the many problems that require very close attention at the present time; and we maintain that it is a matter which should concern the officer in charge, and not be left to chance, or vaguely considered as solely the business of the ship's crew.

The problem may be stated thuswise: A patient, utterly helpless, who requires protection from injury during transfer. He lies upon a stretcher in a boat or barge probably some considerable distance from the ship's deck, and generally hidden from view so far as the man who operates the winch is concerned.

The boat may be a small one—for instance, a stretcher lying thwartships over the after-well of a naval pinnace—and its motion will vary from a condition of steadiness to that of incessant motion according to conditions of weather. Further, the ship herself may be rolling considerably; and yet it is just possible that the patients must be taken on board at all costs.

(1) Safety.—A heavy cradle lowered away under unfavourable conditions proves at once unsuitable, and no small handicap to efficient loading.

It is difficult, and sometimes impossible, to land it safely on a small boat; or into a barge the decks of which are covered with stretchers so closely packed that there is little or no room to place the cradle. We have more than once seen narrow escapes notwithstanding every care as regards the winch.

(2) Speed of Loading.—The method, as carried out by means of a